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May 8, 1997

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Mr. William F. Caton
Federal Communications Commission
Room 222
1919 M Street, N.W.
Washington, D.C. 20554

RE: IB Docket No. 95-183

Dear Mr. Caton:

TRW Inc., by counsel, transmits herewith a copy of comments filed on May 5, 1997 in response to the Commission's Notice of Proposed Rulemaking in IB Docket No. 97-95. Because that proceeding addresses spectrum allocations in bands that include those at issue in the above-referenced docket, TRW respectfully requests that its comments in IB Docket No. 97-95 be included in the record of this proceeding. A copy of these comments is attached for this purpose.

Should there be questions concerning this request, please contact the undersigned counsel.

Respectfully submitted,

David S. Keir

DSK/vlp
cc: Attached Service List

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CERTIFICATE OF SERVICE

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FILE COPY

BEFORE THE

Federal Communications Commission

WASHINGTON, D.C. 20554

In the Matter of	)	
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Allocation and Designation of Spectrum For Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz, and 48.2-50.2 GHz Frequency Bands; Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band; Allocation of Spectrum in the 46.9-47.0 GHz Frequency Band for Wireless Services; and Allocation of Spectrum in the 37.0-38.0 GHz and 40.0-40.5 GHz for Government Operations	)	IB Docket No. 97-95

To: The Commission

COMMENTS OF TRW INC.

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May 5, 1997

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To: The Commission

COMMENTS OF TRW INC.

TRW Inc. ("TRW"), by counsel and pursuant to Sections 1.415 and 1.419 of the Commission's Rules (47 C.F.R. §§ 1.415 & 1.419 (1996)), hereby comments on the Commission proposals contained in the above captioned Notice of Proposed Rulemaking, FCC 97-85 (released March 24, 1997) ("NPRM"). The Commission has proposed domestic allocation of 2 GHz of spectrum each in the Earth-to-space and space-to-Earth directions in the 36 - 51.4 GHz bands for commercial fixed-satellite services ("FSS"), and also sets forth a comprehensive spectrum plan for this broad swath of frequencies, proposing to set aside various blocks for satellite and terrestrial wireless services.

INTRODUCTION AND SUMMARY

As the Commission is aware, TRW has been a participant in many proceedings in recent years relating to the allocation of satellite spectrum, including the "Big LEO" proceeding concerning the 1610-1626.5 MHz and 2483.5-2500 MHz bands, the 2 GHz proceeding and the 30/20 GHz Ka-Band proceeding. These proceedings have provided the Commission and its staff with valuable experience in addressing competing demands for spectrum, and the lessons learned therein should serve as a starting point for tackling the issues presented by the bands above 36 GHz.

TRW also has substantial experience over the past two decades developing hardware for government use in these bands. Among other things, this has given TRW a high level of expertise regarding propagation characteristics and equipment performance at these high frequencies, which make it well-qualified to comment on future spectrum use above 36 GHz.

It is encouraging that the Commission has initiated a proceeding that is broad in scope, designed to deal comprehensively with allocation issues in these bands. As the Commission states in the NPRM, articulating an overall approach to frequency allocation in these bands at the outset should "assist in planning for WRC-97, and ensure

that all proposed uses are given due consideration." NPRM, FCC 97-85, slip op. at 5 (¶ 9).

Nonetheless, TRW is concerned that the plan outlined in the NPRM does not appropriately balance the needs of the satellite industry with users in the terrestrial fixed and mobile services. In particular, while the NPRM appears to contemplate the possibility of at least some wireless use in most of the non-Government frequencies in these bands, it actually shifts FSS and MSS use out of some bands for which they are allocated on a global basis, and thus does not provide sufficient spectrum resources to promote the ongoing development of satellite systems that can utilize the frequencies above 36 GHz. Although the Commission specifically states its desire to set aside global allocations for "the same or similar services," its proposals for the satellite services run counter to this goal.[1/] Nor does the NPRM appear to take into account fully the existing spectrum uses in other regions of the world that will inevitably constrain the use of particular bands for at least some satellite services.

Accordingly, TRW believes that the Commission's approach to formulating a spectrum plan should be reassessed and substantially modified. Most significantly, the Commission should make sure that it preserves as domestic satellite allocations those portions of the current international FSS allocations at 47.2-50.2 GHz (uplink) and 37.5-

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1/ See NPRM, FCC 97-85, slip op. at 6 (¶ 11).

40.5 GHz (downlink)[2/] that remain viable for global implementation. Access to common spectrum bands on a worldwide basis is critical to development of many types of satellite services for both technical and economic reasons. TRW, for example, has had significant experience in the development of nongeostationary satellite systems. Because satellites deployed as part of such systems move in orbits that take them over different regions of the globe, and because of the additional expense and complexity entailed in such systems, it is both technically feasible and economically necessary to serve customers throughout the world. By contrast, although preferable for the purpose of achieving greater economies of scale, it is not essential for terrestrial services to have common allocations throughout the world.

The Commission should adjust its approach to identifying spectrum needs and service development opportunities to take into account the inherent developmental differences between terrestrial and satellite services as well. Because of the long lead-times inherent in developing satellite systems, it is inevitable that proponents of such systems will lag behind those desiring to make terrestrial use of bands that are allocated to both satellite and terrestrial services on a co-primary basis. Based on this inescapable reality, it would be unreasonable for the Commission to premise long-term spectrum planning decisions upon the initial service proposals that come before it; those proposals

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2/ See 47 C.F.R. § 2.106 (1996).

will inevitably come from the terrestrial side, even as satellite companies are well along in their plans to make commercial use of the shared FSS bands. The Commission must be more balanced and forward looking in exercising its spectrum policy functions, and act to ensure that sufficient spectrum resources are available to promote future growth of space-based telecommunications.

Finally, because it is far easier to maintain existing frequency allocations than to secure new ones, the Commission must proceed with particular care in proposing changes that would cede bands allocated to both satellite and fixed services on a co-primary basis to the fixed services alone. Any affirmative domestic action that takes away spectrum already designated on an international basis for satellite service will make it much more difficult politically to obtain additional international allocations through the ITU spectrum allocation process — the World Radiocommunication Conference ("WRC").

For this reason, the Commission should not attempt to finalize a domestic band plan for the spectrum between 36 and 51.4 GHz until after WRC-97, when it will have a greater capability to assess the long-term ramifications of such action. In the interim, the Commission should open its promised filing window for satellite applications in these bands, thereby gathering the information it now sorely lacks on the characteristics of the satellite systems that are seeking access to the bands.

TRW has been involved in the informal efforts to reach a satisfactory resolution to the allocation issues presented in the subject bands, and it looks forward to continuing to work with the Commission to develop spectrum proposals that reflect each of these considerations. The process of successfully formulating such a plan will neither be quick nor easy, but all interested parties must be prepared, as TRW is, to undertake the painstaking task of balancing the interests of both terrestrial fixed spectrum users and those developing satellite systems for deployment above 36 GHz.

DISCUSSION

A. The Commission's Initial Band Plan Proposal Does Not Provide Sufficient Global Allocations For Satellite Use, And Eviscerates Existing Allocations For Specific Several Types Of Satellite Services.

As the Commission acknowledges in the NPRM, allocation of sufficient common spectrum in bands that can be used by the same service globally is a very important consideration.[3/] Because the existing spectrum is already limited in some regions by existing uses, the Commission must act decisively to preserve as much of the useable global allocations as possible for all three types of satellite services — fixed (FSS), mobile (MSS) and broadcast (BSS).

3/ See NPRM, FCC 97-85, slip op. at 6 (¶ 11).

The Commission recognizes in the NPRM the need to ensure that there are consistent worldwide allocations in these bands,[4/] but its proposed band plan would actually undermine this goal with respect to satellite services by eliminating significant portions of the current global FSS and MSS spectrum. Although harmonized international allocations are desirable in many services, terrestrial, as well as satellite, as they provide opportunities to exploit economies of scale in the manufacturing and global sale of equipment and facilitate standardization, they are critical for particular types of satellite systems, especially those that operate in nongeostationary orbits. It is self-evident that systems that seek to provide universal global coverage using space-based facilities that cross international boundaries must have the ability to operate throughout the areas that they cover. Indeed, entire categories of satellite services would be completely foreclosed if worldwide frequency allocations were not available.

The Commission plan set forth in the NPRM is not consistent with the preservation of existing global satellite allocations. Without adequate explanation, the Commission proposes not to permit FSS in two-thirds of the downlink band that is allocated in the international tables (37.5-40.5 GHz). The Commission would preserve only the 37.5-38.5 GHz portion of this band for satellite service, and would further limit

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4/ See NPRM, FCC 97-85, slip op. at 5 (¶ 7) and 6 (¶ 11).

its use to non-geostationary FSS proposals.[5/] Other FSS use for geostationary proposals would be forced into the lower portion of the current BSS band between 40.5 and 42.5 GHz, with the Commission further proposing to make the upper 1 GHz of this band available for terrestrial wireless services rather than BSS. Even the proposal to make the 37.5 - 38.5 GHz band available for satellites is deficient, however, because wireless services believed incompatible with ubiquitous-user satellite systems are already using the 37.0 - 39.5 GHz band in Europe. The effect of this odd imbalance is to eliminate entirely all downlink spectrum available on a global basis for each of the existing satellite services, except for the 40.5 - 41.5 GHz band in which FSS and BSS would be thrown together. The downlink allocation for MSS (at 40.0- 40.5 GHz) is also eliminated for domestic U.S. purposes under this proposal.

The Commission's proposed spectrum plan for these frequencies needs to be overhauled in light of the requirements outlined above for satellite allocations that can be implemented on a global basis. As a general matter, because the roll out of terrestrial services at these high frequencies is likely to proceed slowly given the attenuation characteristics in these bands, it would seem sensible to limit the amount of spectrum allocated for fixed and mobile services until significant demand develops. In the initial stages of use, the terrestrial services should be encouraged to maximize efficiency by

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5/ See NPRM, FCC 97-85, slip op. at 7 (chart) and 11-12 (¶ 21).

sharing a smaller amount of spectrum. For this same reason, the Commission need not promote its underlay concept until fixed or mobile use develops further in this band.

In light of the existing wireless uses in Europe below 39.5 GHz, for example, it would seem appropriate for the U.S. to proceed with terrestrial high density fixed services ("HDFS") in the band 38.5-39.5, but to defer further licensing for such use from 39.5-40.0 GHz to determine whether this band might be shared with satellite systems. This would allow at least some recognition to be paid to the fact that the lower ends of the frequency bands under consideration are more suited to satellite downlinks because atmospheric and rain attenuation problems are reduced. These problems are substantially more troublesome for satellite services than for the fixed service.

Moreover, any new plan that places FSS spectrum in close proximity to the bands above 42.5 - 43.5 GHz band could face obstacles due to the radio-astronomy ("RAS") allocation in these bands. Sharing between satellite downlinks and RAS in adjacent bands has historically proven to be difficult, and often results in significant power flux density and out-of-band emission limits being placed on the satellite users. This concern is clearly applicable to the 41.5 - 42.5 GHz band which directly abuts the RAS allocation. While the Commission presently proposes this band for wireless services, the RAS situation could impose some limits on its flexibility to put an FSS allocation there, and any effort to do so must take this situation into account.

The Commission's proposal to eliminate the global BSS allocation at 40.5-42.5 GHz, replacing the lower 1 GHz with an FSS allocation, was made without any regard to requirements for expansion BSS spectrum. In many parts of the world, there is more demand for BSS spectrum in the planned bands at 12 GHz then there is available spectrum. The 40.5-42.5 GHz band, which is unplanned, is a logical band for administrations to consider to meet BSS requirements that cannot be accommodated in the planned bands. Developing nations zealously guard their rights to access BSS spectrum in the planned bands, and thus may be put off by a U.S. proposal to remove BSS even from an unplanned band.

The Commission's proposed plan for the FSS uplink bands, also has significant defects. First, with respect to the proposals to allocate the band 47.2-48.2 GHz to terrestrial services and the band 48.2-49.2 GHz to NGSO FSS, the Commission has totally removed the prospect for BSS feeder links in the band 47.2-49.2 GHz. BSS feeder links are given a preference in these FSS bands by operation of Radio Regulation S5.552. Apart from the proposal of one terrestrial user — which seeks fully 600 MHz of spectrum in the band 47.2-48.2 GHz for a system of stratospheric repeaters — there is no known requirement for terrestrial systems on the FSS uplink bands.[6/]

6/ In this regard, TRW notes that no competing applications were filed subsequent to the Commission's April 1996 public notice accepting the application of Sky Station International, Inc. for filing. The Commission, in evaluating the requirements for the type (continued...)

Second, the Commission does not contemplate that any type of sharing is possible between satellite users (e.g., BSS feeder links or other large-dish operators) and terrestrial systems in the 47.2-48.2 GHz band. There have been some favorable preliminary indications in U.S. contributions to the ITU-R Study Groups that some sharing is possible in this band. This should be factored into the band plan revision.

B. The Commission's Proposal Does Not To Take Into Account The Manner In Which Satellite Spectrum Allocations Have Typically Been Developed, And Thus Fails To Rationally Accommodate Long-Term Needs For These Services.

One problem that may have helped produce the deficiency in the Commission band plan with respect to global satellite spectrum allocations is its apparent focus on only those proposals that have already taken tangible form before it in service applications or requests for rulemaking. Rational long-term decisionmaking, however, requires that the Commission always remain cognizant of the fact that satellite and

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[6/](...continued)

of service proposed by Sky Station, should consider whether some lesser amount of spectrum (e.g., 250 MHz in each direction) would accommodate the applicant's requirements. In this regard, Sky Station has stated that it can conduct its operations with as little as 10+10 MHz of bandwidth, and that the 300+300 MHz "is needed to satisfy global demand." Reply Comments of Sky Station International, Inc., ET Docket No. 94-124, at 8 (filed May 16, 1996). This assessment, which was unelaborated, assumed sharing "among multiple [stratospheric] licensees authorized in the United States and abroad ..." Id. Even a 50+50 MHz reduction would enable a 500 MHz satellite band to be placed between the two terrestrial/stratospheric segments. As an alternative, the Commission should consider accommodating the stratospheric interests in proposed terrestrial spectrum above 50.2 GHz.

terrestrial services develop according to distinctly different timetables. Because of their relative simplicity and ease of initial implementation, it is difficult to imagine any scenario in which terrestrially-based communications technologies for any given spectrum band would not emerge before space-based applications. This has proven to be the case in every frequency band where both of these services have been allocated from C-band on up — including the bands under consideration in the instant proceeding.

The fundamentally different developmental paths for these services is easily understood. Unlike terrestrial systems, which can be based on "off-the-shelf" technology, satellite systems require long-term planning and development due to their very high initial capital costs and lengthy construction timeframes. It takes a long time and the expenditure of large sums of money (much of which is non-recoverable) to determine the technical feasibility and commercial viability of particular spectrum for satellite services. Satellite hardware must be specially developed for each frequency band before actual use of the spectrum can begin. During the course of this development process, technical approaches may change substantially. For this reason, as well as a desire to withhold information concerning design features from potential competitors, it may be a period of years from the time a satellite company begins developing a new system to the point at which it files an application seeking an FCC authorization.

Terrestrial applications, on the other hand, can be developed quickly and even placed into use before commercial viability is ever considered. Thus, with the expenditure of relatively little capital, terrestrial users can gain "rights" in a band that the Commission will seek to accommodate.

For example, in the case of the 30/20 GHz bands, a long-term NASA-sponsored initiative was instrumental in demonstrating the commercial potential of that spectrum. In the interim, terrestrial users were able to begin using the band through the deployment of a single-cell analog demonstrations system, initially utilizing an experimental license. This use effectively gained the terrestrial system "squatter's rights" in this band, and helped secure the domestic allocation to the largely satellite-incompatible point-to-multipoint fixed service of fully 40 percent of the 2.5 GHz band that was and is allocated internationally to both FSS and the fixed service on a co-primary basis.[7/]

The Commission should not allow the same scenario to play out in the 36/51 GHz bands. As in the Ka-band frequencies, the government through its MilStar program, has already invested billions of dollars developing satellite applications in the spectrum above 36 GHz. This early government investment has paved the way for commercial use of these frequencies.

7/ An additional 130 MHz was allocated to the fixed service at 31 GHz.

In light of the huge government investments in space technology in these bands, the Commission's initial focus in the current proceeding is too narrowly based on "applications now pending" (NPRM, FCC 97-85, slip op. at 6 (¶ 10)), and thus does not give adequate consideration to the range of telecommunications services that are being developed for commercial use of this band. The fact that a band allocated to FSS appears "vacant" does not mean that substantial sums of money are not already being spent by satellite developers who are drawing on their experiences building government satellites for these frequencies and focusing on this spectrum for new private satellite networks.

Given the realities of satellite development, it seems irrational, and clearly arbitrary, for the Commission to look mainly at those applications currently pending before it in establishing a frequency plan between 36 and 51.4 GHz, essentially accommodating services on a first-come, first-served basis. At the very least, it was and is incumbent upon the Commission to invite satellite applications (pursuant to a filing window), and base its judgments concerning future spectrum requirements on the applications it receives. Because the FCC has not yet opened a filing window for additional satellite applications,[8/] it is lacking critical information concerning the range of system proposals that these bands can support. The Commission should not move forward with its band plan proposal until it has solicited additional applications to be

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8/ The "M-Star" system proposed by [Motorola Satellite Communications, Inc.] has been pending since September 1996.

considered concurrently with the single pending satellite application, and thereby informed itself of the satellite industry's requirements for the uses of this spectrum.[9/] It is likely that the information derived from such an approach would be instrumental in producing a spectrum plan that will balance the needs of all interested users.

C. The Commission Must Encourage Realistic Spectrum Sharing Wherever Feasible.

Another defect in the Commission's approach is its apparent decision to close the door on frequency sharing over substantial portions of the 36-51.4 GHz band between space-based communications systems and terrestrial wireless services. While TRW believes that each service should be allocated specific spectrum and encouraged to develop it with maximum efficiency, TRW also believes that it is premature to limit the prospects for sharing between such services until it becomes clearer what types of proposals are being made for the spectrum at issue. All realistic sharing possibilities should be explored, and even where the details are currently unproved, care should be taken not to foreclose preemptively opportunities for co-frequency operation. If this

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9/ In the NPRM, the Commission states its intention to place the Motorola application on public notice in the near future, but suggests that it might limit applicants to applying for the band segments identified in its proposal for FSS use. Such an approach would be a mistake, as it would arbitrarily limit the new technical approaches to frequencies that the Commission has identified for satellite use based on minimal information about actual satellite uses in these bands. The Commission's approach is backwards; it should first determine where the satellite industry needs spectrum to implement new systems and then determine how those needs can be accommodated.

necessitates the imposition of technical regulations that require efficient use of spectrum by terrestrial systems — as opposed to a more unrestricted approach that allows currently proposed characteristics to be utilized without regard to the maximization of efficiency — the Commission must be prepared to take this step.

As a further means of maximizing spectrum use, TRW supports, in principle, the Commission's suggestion that some spectrum be shared between government and non-government users, where such sharing is feasible.[10/] Regardless of which of the three potential sharing methods identified by the Commission is used, however, in order for these efforts to be successful, government users must make a good faith commitment to share information and to act in an open and constructive manner to address the concerns of non-government users.

D. The Commission Must Defer Finalizing Any Domestic Allocations Until The Full International Picture Is Known.

Several of the proposals contained in the Commission's band plan require changes in the international frequency tables — either to add new services to particular bands or to upgrade existing secondary allocations to co-primary status. As the Commission is well aware, proposals of this nature are fraught with risk of possible rejection through the WRC process. Given these dangers, the Commission must not

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10/ See NPRM, FCC 97-85, slip op. at 10 (¶ 18).